Missouri Department of Natural Resources

Biological Assessment Report

Little Niangua River
Hickory and Dallas Counties, Missouri

Fall 2013 – Spring 2014

Prepared for:
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Division of Environmental Quality
Water Protection Program
Water Pollution Control Branch

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1.0 Introduction

At the request of the Missouri Department of Natural Resources (**MDNR**) Water Protection Program (**WPP**), the Environmental Services Program (**ESP**) Water Quality Monitoring Section (**WQMS**) conducted a macroinvertebrate biological assessment and habitat study of Little Niangua River [water body identification number (**WBID**) 1189], specifically the reach located between the confluence of Starks Creek in Hickory County upstream to the confluence of Judge Creek in Dallas County. This stream is located in the Ozark/Osage Ecological Drainage Unit (**EDU**). The primary land uses of the Ozark/Osage EDU are grassland and forest.

The specified section of Little Niangua River is classified as a class P stream per the Missouri Water Quality Standards (**WQS**, MDNR 2014b) with the following designated uses: livestock and wildlife watering; protection of warm water aquatic life and human health-fish consumption; cool water fishery; category A whole body contact recreation; and secondary contact recreation. A class P stream is defined as a stream that maintains permanent flow even in drought periods. Category A whole body contact applies to water segments established as swimming areas.

1.1 Purpose

The purpose of this study was to assess the habitat characteristics, macroinvertebrate community, and physicochemical characteristics of Little Niangua River to determine if the biological community is impaired.

1.2 Tasks

1) Conduct a habitat assessment of Little Niangua River.
2) Conduct a bioassessment of the macroinvertebrate community of Little Niangua River.
3) Conduct physicochemical monitoring of Little Niangua River.

1.3 Null Hypotheses

1) Macroinvertebrate assemblages will not differ among the three Little Niangua River stations.
2) Riparian and instream habitat will not differ among the three Little Niangua River stations.
3) Macroinvertebrate assemblages will not differ between sample stations on the Little Niangua River and biological criteria reference streams located within the Ozark/Osage EDU.
4) Riparian and instream habitat will not differ between sample stations on the Little Niangua River and Saline Creek, a biological criteria reference stream located within the Ozark/Osage EDU.

2.0 Methods

Macroinvertebrate sampling was conducted during fall 2013 and spring 2014 by the Water Quality Monitoring Section’s Aquatic Bioassessment Unit. Fall sampling was

conducted on September 17, 2013, and consisted of macroinvertebrate sampling, stream habitat assessments, and water quality sampling at three stations on Little Niangua River. Additional dissolved oxygen readings were taken on October 10, 2013, at each of the three sampling stations. During the spring, sampling was conducted on March 20, 2014, and consisted of macroinvertebrate sampling and water quality sampling at the same three study stations. Methods for stream habitat assessments, biological assessments, and physicochemical water quality collection are included in this section.

2.1 Station Descriptions

Three stations on Little Niangua River in Hickory and Dallas counties were sampled. Station locations and descriptions are listed below in Table 1. A map of the sampling locations can be found in Figure 1. The location of Hickory and Dallas counties relative to the Ozark/Osage EDU can be found in Figure 2.

Table 1
Descriptive Information for the Little Niangua River Stations

Stations	Location-UTM Zone 15	Description	County	Drainage area, sq. mi.
Little Niangua River 1	491206 E, 4204482 N	Located upstream of CR 96 in Mule Shoe CA	Hickory	144.92
Little Niangua River 2	491713 E, 4196633 N	Located upstream of CR 200	Hickory	110.56
Little Niangua River 3	494189 E, 4193639 N	Located upstream of Prosperity Road	Dallas	62.66

Station 1 is located at Mule Shoe Conservation Area (**CA**). Stations 2 and 3 are located upstream of county road crossings in rural topography. A small non-municipal wastewater treatment facility (Permit Number MO-0117731) has two land application sites located approximately 3.8 miles upstream of station 3.

Figure 1. Little Niangua River Sampling Stations, Fall 2013 and Spring 2014

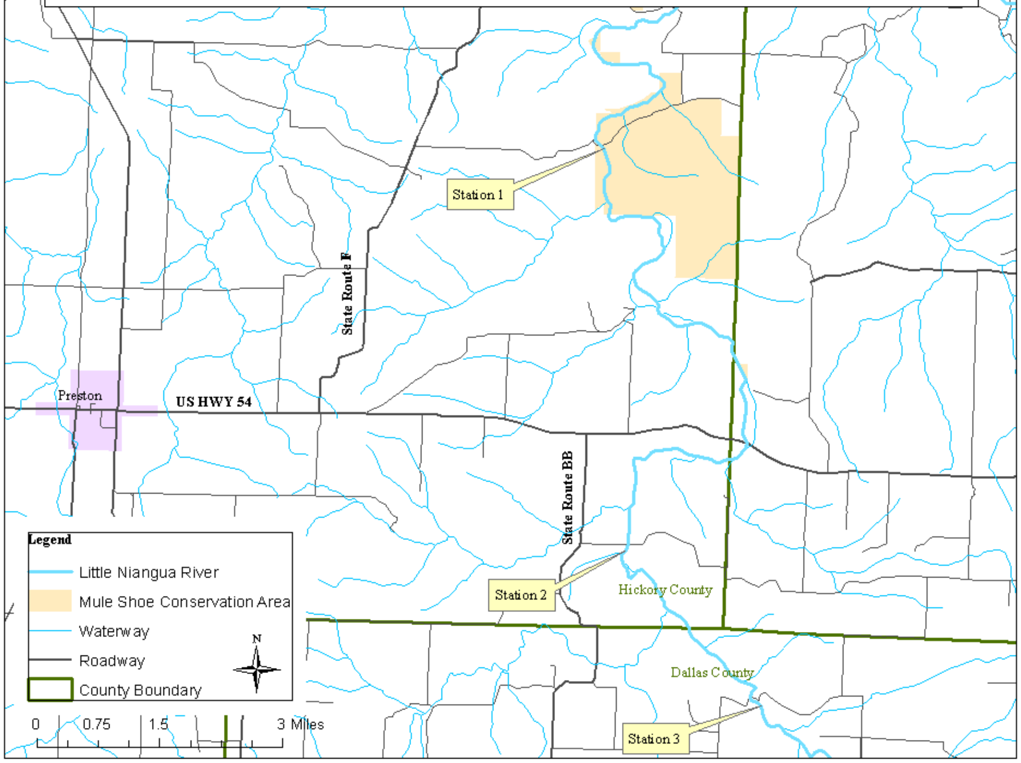
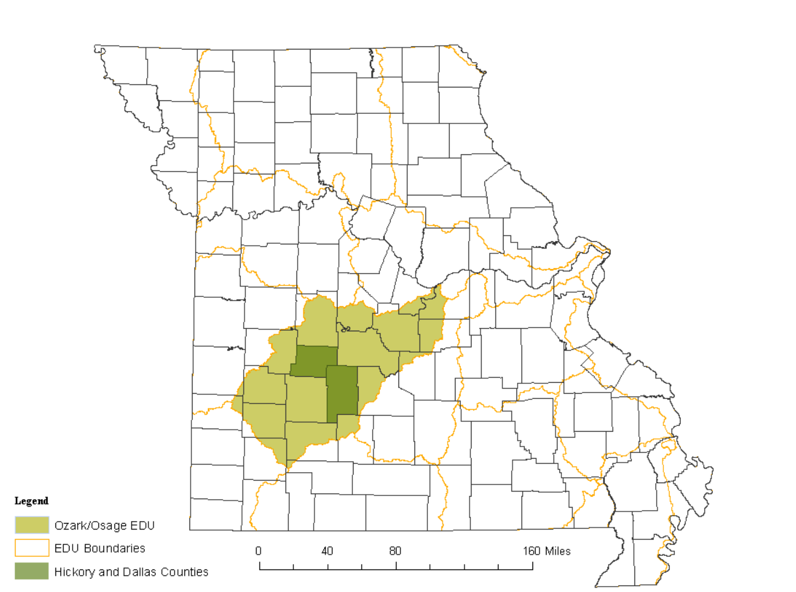


Figure 2. Location of Hickory and Dallas Counties within the Ozark/Osage EDU



2.1.1 Land Use Description

Little Niangua River is located within the Ozark/Osage EDU. An EDU is a region in which biological communities and habitat conditions can be expected to be similar. Table 2 compares the land cover percentages from the Ozark/Osage EDU and the 12-digit Hydrologic Unit Codes (**HUC**) containing the sampling reaches of the study stations. Percent land use data were derived from Thematic Mapper satellite images from 2000-2004 and interpreted by the Missouri Resource Assessment Partnership (Sowa et al. 2004). Figure 3 depicts the land use characteristics of the 12-digit HUCs containing the Little Niangua River sampling reach.

Table 2
Percent Land Use in Little Niangua River
Sampling Stations and the Ozark/Osage EDU

Stations	12-digit HUC	Non-Vegetated	Crop-land	Grass-land	Forest-land	Herba-ceous	Wetland/ Open water
Little Niangua R. 1	102901100305	1.0	2.0	33.7	57.0	4.5	1.8
Little Niangua R. 2	102901100305	1.0	2.0	33.7	57.0	4.5	1.8
Little Niangua R. 3	102901100303	1.4	5.8	51.7	35.6	4.8	0.7
Ozark/Osage EDU	-------	2.7	4.8	43.0	40.0	4.8	4.6

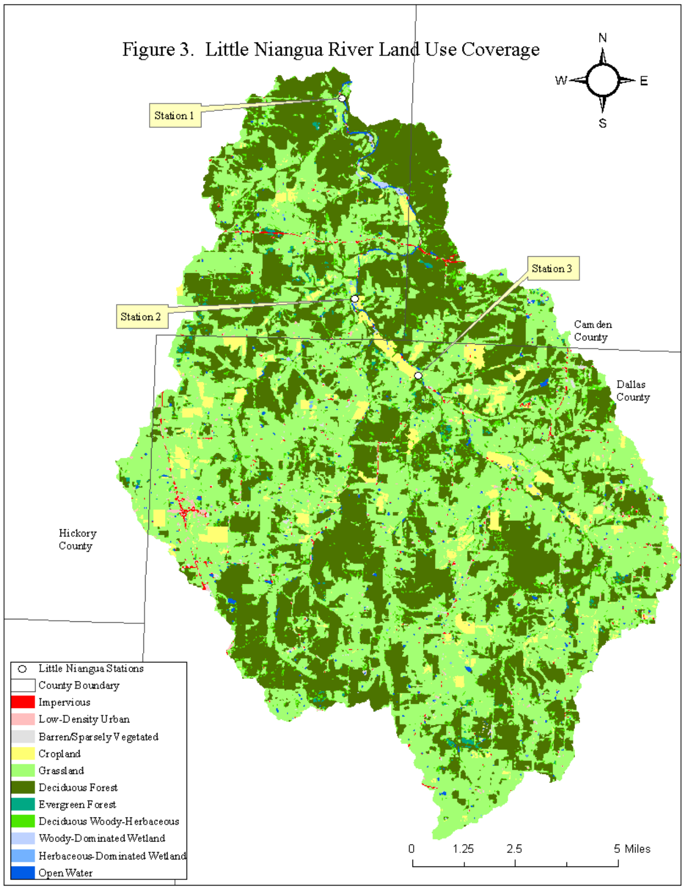


Figure 3. Little Niangua River Land Use Coverage

2.2 Stream Habitat Assessment Project Procedure

Standardized assessment procedures were followed as described for riffle/pool prevalent streams in the Stream Habitat Assessment Project Procedure (**SHAPP**, MDNR 2010d). According to the SHAPP, an aquatic community is influenced by the quality of the stream habitat. Stream habitat quality is scored for each station and the scores are compared with a control stream (biological criteria reference reach) SHAPP score. If the SHAPP score at a test station is $\geq$75% of the SHAPP control score, the stream habitat at the test station is considered to be comparable to the control stream. Saline Creek, located in Miller County approximately 2.5 miles southeast of Eldon, is a biological criteria reference stream that was chosen as the SHAPP control. The habitat assessment of Saline Creek was performed on October 10, 2013. SHAPP scores were calculated for the Little Niangua River stations, compared to the biological criteria reference SHAPP, and examined for irregular results.

2.3 Bioassessment

2.3.1 Macroinvertebrate Sampling and Analyses

Macroinvertebrate sampling was conducted according to the Semi-quantitative Macroinvertebrate Stream Bioassessment Project Procedure (**SMSBPP**, MDNR 2012c). Little Niangua River is considered a riffle/pool dominated system. The three standard

habitats sampled at all locations were flowing water over coarse substrate, non-flowing water over depositional substrate, and rootmat. Macroinvertebrate samples were subsampled in the laboratory and identified to specific taxonomic levels (MNDR 2014a) in order to develop biological metrics (MDNR 2012c).

Little Niangua River macroinvertebrate data were evaluated relative to the biological reference streams in the Ozark/Osage EDU. Biological criteria are calculated separately for the fall (mid-September through mid-October) and spring (mid-March through mid-April) index periods. The SMSBPP provides details on the calculation of metrics and scoring of the multi-metric Macroinvertebrate Stream Condition Index (**MSCI**). The four components of the MSCI are Taxa Richness (**TR**); Ephemeroptera, Plecoptera, and Trichoptera Taxa (**EPTT**); Biotic Index (**BI**); and the Shannon Diversity Index (**SDI**). An MSCI score of 16-20 is considered fully supporting, 10-14 partially supporting, and 4-8 non-supporting of the protection of warm water aquatic life beneficial use designation as listed in the Missouri WQS (MDNR 2014b).

2.3.2 Physicochemical Water Sampling and Analyses

Physicochemical water samples were handled according to the appropriate MDNR ESP Standard Operating Procedure (**SOP**) or Project Procedure (**PP**). Results for physicochemical water parameters were examined by season and station by field measurements or grab samples collected in accordance with the SOP MDNR-ESP-001, *Required/Recommended Containers, Volumes, Preservatives, Holding Times, and Special Sampling Considerations* (MDNR 2011). All samples were kept on ice during transport to ESP.

Water quality parameters were measured *in-situ* or collected and returned for analyses at the state environmental laboratory in Jefferson City. Temperature (°C, MDNR 2010c), pH (MDNR 2012a), specific conductance (μS/cm, MDNR 2010b), dissolved oxygen (mg/L, MDNR 2012b), and discharge (cubic feet per second-cfs, MDNR 2013) were measured in the field. Turbidity (**NTU**, MDNR 2010a) was measured and recorded in the ESP, WQMS biology laboratory. The ESP Chemical Analysis Section (**CAS**) conducted analyses for the following: calcium, magnesium, hardness as $CaCO_3$, sulfate, ammonia-nitrogen, nitrate+nitrite-nitrogen, total nitrogen, total phosphorus, chloride, and non-filterable reside (all parameters reported in mg/L).

Physicochemical water parameters were compared among stations as well as with Missouri's WQS (MDNR 2014b). Interpretation of acceptable limits in the WQS may be dependent on a stream's classification and beneficial uses as designated in the WQS (MDNR 2014b).

2.3.3 Discharge

Stream flow was measured using a Marsh-McBirney Model 2000 Flo-Mate™ current meter at each station during both sampling seasons in accordance with the SOP MDNR-ESP-113, *Flow Measurement in Open Channels* (MDNR 2013).

3.0 Results and Analyses

3.1 Land Use

The land use data in Table 2 provide a comparison between the 12-digit hydrologic units covering the study reach of the Little Niangua River and the Ozark/Osage EDU. The study stream comprised two 12-digit hydrologic units; stations 1 and 2 were in a separate hydrologic unit than station 3. Compared to station 3, the hydrologic unit of stations 1 and 2 contained less cropland (2.0 percent compared to 5.8 percent) and grassland (33.7 percent compared to 51.7 percent) and contained more forestland (57.0 percent compared to 35.6 percent). The non-vegetated land and herbaceous coverage are comparable between the two hydrologic units. More wetland/open water was present in the HUC for stations 1 and 2 (1.8 percent) compared to the station 3 HUC (0.7 percent).

Comparison of land use between the Ozark/Osage EDU and the 12-digit HUCs containing the study segments showed that the percent of grassland and forestland were mid-range compared to the separate 12-digit hydrologic units. The Ozark/Osage EDU had more non-vegetated land and wetland/open-water than either of the study stream hydrologic units and contained more cropland than stations 1 and 2 but less cropland than station 3. Herbaceous land cover of the EDU was comparable to the Little Niangua River watershed.

3.2 Stream Habitat Assessment

Habitat assessment scoring results are found in Table 3. If the study station SHAPP score is $\geq$75% of the control station score, the stations are considered to contain comparable habitats to the control station. Comparable habitats should support similar biological communities. All stations scored $\geq$75% of the SHAPP control, Saline Creek, with the two downstream stations scoring higher than the control site. Based on SHAPP scores, it is inferred that the Little Niangua River stations have habitats similar to the reference (control) stream and should, therefore, support a comparable biological community.

Table 3
Stream Habitat Assessment Scores and Percentage Comparison

Station	Score	% of Reference
Little Niangua River 1	133	>100%
Little Niangua River 2	125	>100%
Little Niangua River 3	109	88.6%
Saline Creek (SHAPP Control)	123	--

Little Niangua River had ample epifaunal substrate available at station 1 with a variety of cobble and gravel sized materials in the stream and gravel bars present along the margins of the bank. Stations 2 and 3 ranked lower on available cover due to increased amounts of smaller-sized substrate. Station 2 contained a variety of cobble and gravel. Station 3 contained mostly gravel-sized substrate or smaller. Water willow (*Justicia* sp.) growth was extensive at station 2, covering about a quarter of the stream reach. All stations had

a fair amount of sediment deposition along the gravel bars and bends and also at obstructions in the water. All stations had three depth regimes present (slow-deep, slow-shallow, fast-shallow) but lacked any fast-deep flow regimes. The channel flow status appeared low and lessened moving upstream from station 1 to station 3. There was no channelization present, however rip rap had been installed at the bridges. Station 2 had prevalent erosion along a portion of one bank with many large trees in the water along this reach. Throughout the stream most riffles were short and narrow, particularly at station 3. All riffle areas at stations 2 and 3 were of marginal quality. Only two riffles were present in the assessed reach of station 1. One riffle was of poor quality, characterized by being very short and narrow and having small substrate, whereas the other riffle was better quality. It was longer with fast-flowing water over a mix of gravel and cobble substrate. Stream banks were mostly stable at stations 1 and 3. Station 2 had severe erosion occurring along a portion of one bank, whereas the opposing bank was in good condition. Vegetative protection along the banks scored fairly low at each station. All three stations had a well-established riparian corridor along at least one bank with a good mix of trees, understory growth, and grasses. The opposing riparian corridors of each station were impaired by pasture areas.

Saline Creek, the SHAPP control, had suboptimal epifaunal substrate and low embeddedness. Stable areas of cobble and large gravel were present in the stream, but there were also large areas of small-sized substrate present. There was a moderate amount of sediment deposition on the gravel bars and bends. Similar to the study stream, the fast-deep depth regime was lacking, but the other three types of velocity/depth regimes were present (slow-deep, slow-shallow, fast-shallow). The channel flow status appeared low, and riffle quality was marginal. Riffles were not as wide as the stream and were less than two times the stream width. No bedrock was present in the reach assessed, and the vegetative protection along the banks ranked low. The stream reach lacked any evidence of channelization and had good riparian areas with adequate bank stability.

3.3 Biological Assessment and Macroinvertebrate Community Analyses

Tables 4 and 5 provide scoring criteria and results for the fall and spring index periods, respectively. MSCI scores were calculated by scoring test station biological metrics using the appropriate biological criteria reference stream (**BIOREF**) criteria. An MSCI score of 16-20 is considered fully supporting, 10-14 is partially supporting, and 4-8 is considered non-supporting. Little Niangua River had fully supporting MSCI scores at all three stations during both sampling seasons.

Table 4
Biological Criteria Reference (BIOREF) Metric Scores, Biological Support Category, and Macroinvertebrate Stream Condition Index (MSCI) Scores, Fall 2013

Stations	Sample No.	TR	EPTT	BI	SDI	MSCI	Support
Little Niangua River 1	132002	91	25	5.8	3.41	20	Full
Little Niangua River 2	132001	97	26	6.2	3.43	20	Full
Little Niangua River 3	132000	88	19	6.3	3.60	18	Full
BIOREF Score=5		>84	>19	<6.6	>3.23	20-16	Full
BIOREF Score=3		84-42	19-9	6.6-8.3	3.23-1.61	14-10	Partial
BIOREF Score=1		<42	<9	>8.3	<1.61	8-4	Non

MSCI Scoring Table (in light gray) developed from BIOREF streams (n = 28). TR=Taxa Richness; EPTT=Ephemeroptera, Plecoptera, Trichoptera Taxa; BI=Biotic Index; SDI=Shannon Diversity Index

Table 5
Biological Criteria Reference (BIOREF) Metric Scores, Biological Support Category, and Macroinvertebrate Stream Condition Index (MSCI) Scores, Spring 2014

Stations	Sample No.	TR	EPTT	BI	SDI	MSCI	Support
Little Niangua River 1	149829	99	31	5.7	3.61	20	Full
Little Niangua River 2	149830	101	31	5.7	3.64	20	Full
Little Niangua River 3	149831	92	28	5.8	3.42	20	Full
BIOREF Score=5		>90	>22	<6.2	>3.24	20-16	Full
BIOREF Score=3		90-45	22-11	6.2-8.1	3.24-1.62	14-10	Partial
BIOREF Score=1		<45	<11	>8.1	<1.62	8-4	Non

MSCI Scoring Table (in light gray) developed from BIOREF streams (n = 40). TR=Taxa Richness; EPTT=Ephemeroptera, Plecoptera, Trichoptera Taxa; BI=Biotic Index; SDI=Shannon Diversity Index

The fall 2013 macroinvertebrate community analysis is shown in Table 6. The total percentage of EPT taxa ranged from 40.4 percent to 54.3 percent. Ephemeroptera composed the majority of the biological community at all three stations. Plecoptera taxa composed 2.2 percent of the biological community at station 1, which was higher than either of the other stations. Trichoptera taxa were present at all three stations, but station 2 had the highest abundance. Dipteran taxa ranged from 21.0 percent to 28.7 percent, with Chironomidae as the most abundant family at all three stations. Baetidae, Elmidae, and Hydropsychidae were also common at all three stations, whereas Caenidae was abundant at stations 2 and 3.

During the fall, *Baetis* sp., *Cheumatopsyche* sp., and *Tanytarsus* sp. were the most abundant taxa at station 1. *Baetis* sp. and *Tanytarsus* sp. were also common at station 2 and 3 but were collected in lesser numbers. *Cheumatopsyche* sp., *Hyalella azteca*, and *Caenis anceps* were the most abundant taxa collected at stations 2 and 3.

Table 6
Fall 2013 Macroinvertebrate Community Analysis

Fall 2013					
Little Niangua River 1		Little Niangua River 2		Little Niangua River 3	
Order	%	Order	%	Order	%
Ephemeroptera	40.1	Ephemeroptera	33.8	Ephemeroptera	30.7
Plecoptera	2.2	Plecoptera	0.7	Plecoptera	0.6
Trichoptera	12.0	Trichoptera	16.0	Trichoptera	9.1
Total EPT%	54.3	Total EPT%	50.5	Total EPT%	40.4
Diptera	21.0	Diptera	26.1	Diptera	28.7
Dominant Macroinvertebrate Families					
Family	%	Family	%	Family	%
Chironomidae	18.5	Chironomidae	23.4	Chironomidae	27.1
Baetidae	17.2	Hydropsychidae	15.0	Caenidae	13.9
Elmidae	12.8	Caenidae	12.5	Hyalellidae	8.9
Hydropsychidae	10.2	Baetidae	9.9	Hydropsychidae	8.0
Heptageniidae	6.5	Hyalellidae	8.8	Baetidae	7.9
Leptohyphidae	6.2	Elmidae	6.4	Elmidae	5.1

The spring 2014 macroinvertebrate community analysis is shown in Table 7. All stations had EPT taxa present, with total EPT taxa ranging from 20.2 percent to 34.7 percent. Ephemeroptera were considerably less abundant during the spring sampling season. Trichoptera were less abundant as well; however, Plecoptera were more abundant compared to the fall results. Dipteran taxa were present in higher numbers, ranging from 57.4 percent to 67.7 percent. As in the fall, Chironomidae was the dominant family.

The chironomids *Cricotopus/Orthocladius*, *Eukiefferiella* sp., and *Tanytarsus* sp. were abundant at all three stations during the spring sampling period. *Isoperla* sp. and *Prostoia* sp. were common at stations 1 and 2, whereas Chloroperlidae was the common Plectoptera taxa at station 3. Although Chloroperlidae was also common at station 2, it was collected in lesser numbers. *Caenis anceps* was fairly abundant at stations 2 and 3. *Acarina* was also common during the spring, particularly at station 3.

Table 7
Spring 2014 Macroinvertebrate Community Analysis

Spring 2014					
Little Niangua River 1		Little Niangua River 2		Little Niangua River 3	
Order	%	Order	%	Order	%
Ephemeroptera	10.4	Ephemeroptera	13.4	Ephemeroptera	7.8
Plecoptera	10.7	Plecoptera	13.9	Plecoptera	10.4
Trichoptera	4.2	Trichoptera	7.4	Trichoptera	1.9
Total EPT%	25.3	Total EPT%	34.7	Total EPT%	20.1
Diptera	67.7	Diptera	57.4	Diptera	65.9
Dominant Macroinvertebrate Families					
Family	%	Family	%	Family	%
Chironomidae	64.0	Chironomidae	54.4	Chironomidae	61.9
Nemouridae	4.2	Caenidae	7.3	Caenidae	5.5
Perlodidae	3.6	Hydropsychidae	6.5	Arachnida	4.7
Hydropsychidae	3.3	Nemouridae	4.9	Chloroperlidae	4.4
Heptageniidae	3.1	Chloroperlidae	3.2	Ceratopogonidae	3.2
Ceratopogonidae	3.1	Perlodidae	2.9	Perlidae	3.1

3.4 Physicochemical Water Parameters

Physicochemical results can be found in Tables 8, 9, and 10. The physicochemical results for both seasons were fairly consistent throughout the watershed. Dissolved oxygen levels ranged from 4.14 mg/L to 7.12 mg/L during the fall sampling period. Station 3 did drop below the 5.0 mg/L minimum criterion stated in the WQS (MDNR 2014b). In response to the low dissolved oxygen value at station 3, additional dissolved oxygen field measurements were collected during October 2013. These values ranged from 7.88 mg/L to 9.14 mg/L. During the spring sampling season, dissolved oxygen levels ranged from 10.64 mg/L to 12.25 mg/L. Flow measurements ranged from 0.1 cfs to 2.5 cfs during the fall sampling period and from 8.8 cfs to 30.8 cfs during the spring. Turbidity was relatively low during both seasons. The highest turbidity value was 2.68 NTU during the fall sampling season at station 2. Compared to the Missouri WQS (MDNR 2014b), the physicochemical water quality parameters analyzed for this study were not elevated during either season. Dissolved oxygen, however, was below the minimum standard at station 3 during the fall sampling season. The low flow measured at that station, 0.1 cfs, may have contributed to the low dissolved oxygen.

Although there are currently no nutrient criteria in place for Missouri streams and rivers, the values for each season were compared to the United States Environmental Protection Agency's (**USEPA**) December 2000 Ambient Water Quality Criteria Recommendations for Rivers and Streams in Nutrient Ecoregion XI (USEPA 2000). USEPA's recommended values are as follows: 0.093 mg/L nitrate + nitrite, 0.31 mg/L total nitrogen, 0.01 mg/L total phosphorus, and 2.3 NTU turbidity. Nitrate + nitrite and total

nitrogen were within EPA's acceptable ranges at all three stations during both seasons. Total phosphorus values exceeded EPA's recommended criteria at all three stations during the fall sampling season, but these values were recorded by CAS as estimates detected below the practical quantitation level (**PQL**). Only station 2 had turbidity values that exceeded USEPA's recommended 2.3 NTU during the fall. Turbidity values were below EPA's recommended value during the spring.

Table 8
Fall 2013 Physicochemical Water Parameters

Stations Parameters	Little Niangua River 1	Little Niangua River 2	Little Niangua River3
Sampling time	1325	1125	0915
Calcium (mg/L)	45.5	42.1	41.3
Magnesium (mg/L)	26.9	24.4	23.3
Ammonia as N (mg/L)	<0.03*	<0.03*	<0.03*
Chloride (mg/L)	4.22**	5.52	6.75
Dissolved Oxygen (mg/L)	7.12	5.61	4.14
pH (su)	7.7	7.5	7.0
Specific Conductance (µS/cm)	360	335	332
Temperature (°C)	20.0	20.0	20.0
Turbidity (NTU)	1.38	2.68	1.04
Flow (cfs)	2.5	0.5	0.1
Hardness as $CaCO_3$ (mg/L)	224	206	199
Nitrate+Nitrite as N (mg/L)	0.069	0.049	0.057
Sulfate (mg/L)	6.89	7.04	6.71
Non-Filterable Residue (mg/L)	<5*	10.0	<5*
Total Nitrogen (mg/L)	0.21	0.22	0.19**
Total Phosphorus (mg/L)	0.017**	0.025**	0.017**

* Below detectable limits
** Estimated Value, detected below PQL

Table 9
October 10, 2013 Dissolved Oxygen Values

Stations	Sampling Time	DO Values (mg/L)
Little Niangua River 1	1130	9.14
Little Niangua River 2	1151	8.10
Little Niangua River 3	1216	7.88

Table 10
Spring 2014 Physicochemical Water Parameters

Stations / Parameters	Little Niangua River 1	Little Niangua River 2	Little Niangua River 3
Sampling time	0930	1130	1240
Calcium (mg/L)	45.8	44.2	43.2
Magnesium (mg/L)	28.5	27.3	26.8
Ammonia as N (mg/L)	<0.03*	<0.03*	<0.03*
Chloride (mg/L)	7.01	8.25	8.56
Dissolved Oxygen (mg/L)	10.64	10.71	12.25
pH (su)	8.6	8.4	8.3
Specific Conductance (µS/cm)	413	359	393
Temperature (°C)	8.0	8.3	10.0
Turbidity (NTU)	1.67	1.29	< 1
Flow (cfs)	30.8	24.9	8.8
Hardness as $CaCO_3$ (mg/L)	232	223	218
Nitrate+Nitrite as N (mg/L)	0.008*	0.008*	0.008*
Sulfate (mg/L)	13.8	15.4	16.3
Non-Filterable Residue (mg/L)	<5*	<5*	<5*
Total Nitrogen (mg/L)	0.093**	<0.04*	<0.04*
Total Phosphorus (mg/L)	<0.01*	<0.01*	<0.01*

* Below detectable limits
** Estimated Value, detected below PQL

4.0 Discussion

4.1 Land Use

Station 1 was located along the western edge of Mule Shoe Conservation Area. Just outside the conservation area was pastureland. The creek meanders through nearly 8 miles of forest, cropland, and grasslands between stations 1 and 2. At station 2, the stream made a bend upstream of the bridge crossing and more or less paralleled a portion of the county road. The bridge at this site had recently been replaced, and the area had bare ground along the banks immediately around the bridge. It appeared that the riparian corridor was affected to accommodate the machinery needed for the bridge work. Station 2 is located approximately 2.5 miles downstream of station 3 with mostly farmland and forest between the two. The watershed upstream of station 3 appears to be mostly farmland, cropland and pasture with areas of forest interspersed throughout.

Comparison of the cropland, grassland, and forestland coverages between the EDU and the 12-digit HUCs showed stations 1 and 2 contained less cropland and grassland and more forestland than the EDU. In contrast, Station 3 contained more cropland and grassland and less forestland compared to the EDU. The EDU had similar coverage of herbaceous land but more non-vegetated land and wetland/open-water compared to the

study stream. The differences in land use between the EDU and the HUC containing the study stream were minor.

4.2 Stream Habitat Assessment

The SHAPP scores for all three Little Niangua River stations were >75% of the Saline Creek SHAPP control stream score. Sediment deposition was present throughout the stream reach but did not appear to be excessive. Vegetative protection of the banks ranked fairly low at each station as well as at the control site likely due to the rocky nature of the topography. The riparian vegetative zone width ranked low along one side of each of the study stream reaches and was nearly lacking in some areas. All stations had well-developed riparian corridors on the opposing bank. Saline Creek had a well-established riparian zone along both banks.

4.3 Biological Assessment and Macroinvertebrate Community Analysis

Based on Ozark/Osage EDU biological criteria reference data, all stations attained MSCI scores in the fully supporting range (score of 16-20) for both the fall and spring sampling seasons. Stations 1 and 2 attained the highest possible MSCI score of 20 during both seasons, whereas station 3 attained the highest score only during the spring. The presence of a single additional EPT taxon at station 3 during the fall would have elevated the EPTT metric into the optimal category and resulted in the highest MSCI score for that season as well.

Macroinvertebrate abundance was high. For most sites during the fall, less than 5 percent of the habitats at each station were subsampled to reach the target numbers. The exception to this was the coarse substrate at each station. A total of 7.3 percent was subsampled at station 1 and 6.25 percent at stations 2 and 3. During the spring, the highest percentage subsampled was 12.5 percent at the non-flow habitat at station 1. Less than 10 percent of the coarse substrate and rootmat habitats at station 1 were subsampled and less than 10 percent of all habitats of stations 2 and 3 were subsampled.

4.4 Physicochemical Water Parameters

The physicochemical data revealed all values to be fairly consistent for each sampling season. Aside from elevated phosphorus levels during the fall, the physicochemical data did not show any significant trends. It appears that physicochemical water quality did not affect the biological community during the study seasons.

5.0 Conclusion

Four null hypotheses were stated in the introduction: 1) macroinvertebrate assemblages will not differ among the three Little Niangua River stations; 2) riparian and instream habitat will not differ among the three Little Niangua River stations; 3) macroinvertebrate assemblages will not differ between sample stations on Little Niangua River and biological criteria reference streams located within the Ozark/Osage EDU; and 4) riparian and instream habitat will not differ between sample stations on Little Niangua River and Saline Creek, a biological criteria reference stream located within the Ozark/Osage EDU.

Null hypothesis #1 is accepted. All three stations scored fully biologically supporting during both seasons and the dominant taxa at Little Niangua River were similar among stations. Minor differences were present presumably due to stream gradient. Baetidae and Elmidae were more common at station 1 than station 2 or 3. Caenidae was more common at stations 2 and 3.

Null hypothesis #2 is accepted. SHAPP scores among the three Little Niangua River stations differed by only 24 points. As the SHAPP scores imply, habitat quality of the three Little Niangua River stations was comparable to one another.

Null hypothesis #3 is accepted. Reference streams within the EDU represent the best available conditions and are the basis for calculating MSCI scores. All three stations scored fully supporting during both seasons, indicating that Little Niangua River has a similar macroinvertebrate community compared to Ozark/Osage EDU biological criteria reference streams.

Null hypothesis #4 is accepted. The SHAPP scores of the study stations all scored >75% of the SHAPP control stream. The habitat quality of Little Niangua River is comparable to the biological criteria reference station on Saline Creek.

The bioassessment for the Little Niangua River, WBID 1189, suggests no biological impairment due to water quality or habitat parameters. The MSCI scores of all three stations during both sampling seasons scored ≥18, indicating a healthy macroinvertebrate community. Habitat scores for the study stations are considered comparable to the control station. Ample cover was available for macroinvertebrates, and all stations had adequate epifaunal cover and instream habitat. In addition to the gravel and cobble instream, submerged logs, undercut banks, and rootmats were present at all stations. Although the riparian corridor was limited along one bank at each test station, the opposing banks had fully established riparian zones. There was no evidence of instream channelization at any of the stations. The physicochemical results revealed few definitive trends other than typical seasonal differences.

6.0 Literature Cited

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Appendix A

Invertebrate Database Bench Sheet Report:
Little Niangua River, Hickory and Dallas Counties
Grouped by Season and Station

Aquid Invertebrate Database Bench Sheet Report
Little Niangua R [132002], Station #1, Sample Date: 9/17/2013 1:45:00 PM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina	2	7	9
AMPHIPODA			
Hyalella azteca			35
ARHYNCHOBDELLIDA			
Erpobdellidae			1
BASOMMATOPHORA			
Ancylidae			1
Lymnaeidae			1
Menetus			1
COLEOPTERA			
Ancyronyx variegatus			6
Berosus	2		2
Dubiraphia		2	69
Ectopria nervosa		1	
Macronychus glabratus			6
Scirtidae			6
Stenelmis	3	79	3
DECAPODA			
Orconectes luteus	2	-99	
Orconectes virilis			-99
DIPTERA			
Ablabesmyia		12	1
Anopheles			3
Ceratopogoninae	1	9	
Chironomidae		1	
Chironomus		2	
Chrysops		1	
Cladopelma		1	
Cladotanytarsus		11	
Corynoneura	2		
Cricotopus bicinctus			1
Cricotopus/Orthocladius			1
Cryptochironomus		3	
Dicrotendipes	1	2	
Dixella			2
Hemerodromia	1		
Hexatoma	10	2	
Labrundinia			5
Paratanytarsus		1	4
Pentaneura	1		
Phaenopsectra			1
Polypedilum flavum	43		2
Polypedilum illinoense grp	1		6

Aquid Invertebrate Database Bench Sheet Report
Little Niangua R [132002], Station #1, Sample Date: 9/17/2013 1:45:00 PM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Polypedilum ontario	1		
Polypedilum scalaenum grp	1	12	
Pseudochironomus		4	
Rheotanytarsus	8		2
Simulium	4		
Stempellinella		3	
Stenochironomus			1
Tabanus	-99	-99	
Tanytarsus	4	58	34
Thienemanniella	1		1
Thienemannimyia grp.	10		
Tribelos		1	
EPHEMEROPTERA			
Acentrella	3	2	
Acerpenna	18		1
Anthopotamus		2	
Baetis	178		
Baetisca lacustris	1		
Caenis anceps	7	4	
Caenis latipennis	6	30	2
Choroterpes		9	1
Isonychia bicolor	72		
Leucrocuta	9		
Maccaffertium mediopunctatum	21		
Maccaffertium pulchellum	16	1	
Procloeon		21	3
Stenacron	1	6	1
Stenonema femoratum		31	
Tricorythodes	59	3	19
HEMIPTERA			
Belostoma			-99
Rheumatobates			1
LUMBRICINA			
Lumbricina		1	
MEGALOPTERA			
Corydalus	-99		
Sialis		1	
NEOTAENIOGLOSSA			
Elimia		-99	3
Hydrobiidae		2	2
ODONATA			
Argia		7	8
Enallagma			42
Hagenius brevistylus	1		
Macromia		-99	

Aquid Invertebrate Database Bench Sheet Report
Little Niangua R [132002], Station #1, Sample Date: 9/17/2013 1:45:00 PM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Nasiaeschna pentacantha			-99
PLECOPTERA			
Neoperla	10	17	
Perlinella ephyre		2	
TRICHOPTERA			
Cheumatopsyche	134		
Chimarra	3		
Hydroptilidae			4
Nectopsyche			9
Oecetis			6
Orthotrichia			1
Pycnopsyche			-99
TRICLADIDA			
Planariidae			1
TUBIFICIDA			
Quistradrilus multisetosus			1
Tubificidae		4	2
VENEROIDA			
Corbicula	5	5	
Pisidiidae			-99

Aquid Invertebrate Database Bench Sheet Report
Little Niangua R [132001], Station #2, Sample Date: 9/17/2013 12:10:00 PM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina	15	6	3
AMPHIPODA			
Hyalella azteca		2	130
ARHYNCHOBDELLIDA			
Erpobdellidae	-99		
BASOMMATOPHORA			
Ancylidae	1		1
Menetus			1
Physella		-99	1
COLEOPTERA			
Berosus		1	6
Dubiraphia		4	16
Ectopria nervosa		1	
Enochrus			1
Microcylloepus pusillus	1		
Psephenus herricki	2	2	
Scirtidae	2		2
Stenelmis	11	62	1
DECAPODA			
Orconectes luteus	1	-99	
DIPTERA			
Ablabesmyia		23	7
Anopheles			4
Ceratopogoninae	1	1	
Cladopelma		1	
Cladotanytarsus		12	1
Corynoneura	1	1	1
Cricotopus/Orthocladius	3		2
Cryptochironomus		4	1
Cryptotendipes		1	
Culex			1
Dicrotendipes		3	5
Dixella			4
Endochironomus			1
Forcipomyiinae			2
Glyptotendipes			1
Hemerodromia	1		
Hexatoma	14	4	
Labrundinia			6
Nanocladius			3
Nilotanypus	2		
Parachironomus			6
Parametriocnemus	1		

Aquid Invertebrate Database Bench Sheet Report
Little Niangua R [132001], Station #2, Sample Date: 9/17/2013 12:10:00 PM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Paratanytarsus		4	5
Pentaneura		2	
Polypedilum fallax grp	1		1
Polypedilum flavum	89		3
Polypedilum illinoense grp	1		10
Polypedilum scalaenum grp			2
Procladius		2	
Pseudochironomus		5	5
Rheotanytarsus	44		1
Simulium	5		
Stempellinella		7	1
Tabanus	2	1	
Tanytarsus		20	26
Thienemanniella	1		
Thienemannimyia grp.		28	6
EPHEMEROPTERA			
Acentrella	4		
Acerpenna	37		
Anthopotamus		1	
Baetis	74		
Caenis anceps	11	116	2
Caenis latipennis	3	45	10
Choroterpes	4	32	2
Isonychia bicolor	22		
Leucrocuta	11	1	
Maccaffertium mediopunctatum	4		
Maccaffertium pulchellum	22		
Procloeon		27	6
Stenacron		2	
Stenonema femoratum		46	1
Tricorythodes	14	3	4
HEMIPTERA			
Belostoma			-99
Rhagovelia	1		1
Trepobates	1		-99
LUMBRICINA			
Lumbricina	2	-99	1
LUMBRICULIDA			
Lumbriculidae		1	
MEGALOPTERA			
Corydalus	1		
Sialis		-99	
NEOTAENIOGLOSSA			
Elimia	1	4	3

Aquid Invertebrate Database Bench Sheet Report
Little Niangua R [132001], Station #2, Sample Date: 9/17/2013 12:10:00 PM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
ODONATA			
Argia		5	7
Basiaeschna janata			-99
Enallagma			29
Erythemis			-99
Macromia			-99
Stylogomphus albistylus		4	1
PLECOPTERA			
Neoperla	10		
TRICHOPTERA			
Cheumatopsyche	224		
Chimarra	2		
Hydroptila			2
Limnephilidae			-99
Nectopsyche		3	1
Nyctiophylax			2
Oecetis			1
Orthotrichia			1
Oxyethira			1
Triaenodes			2
TRICLADIDA			
Planariidae	1		
TUBIFICIDA			
Branchiura sowerbyi		1	
Enchytraeidae		2	
Tubificidae	1	3	2
VENEROIDA			
Pisidiidae	2	3	

Aquid Invertebrate Database Bench Sheet Report
Little Niangua R [132000], Station #3, Sample Date: 9/17/2013 10:15:00 AM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina	18	21	5
AMPHIPODA			
Hyalella azteca		4	119
ARHYNCHOBDELLIDA			
Erpobdellidae		-99	
BASOMMATOPHORA			
Ancylidae	1	1	3
Gyraulus		3	4
Lymnaeidae			1
Menetus		1	4
Physella	2	1	9
Planorbella			1
COLEOPTERA			
Berosus	6	17	8
Dubiraphia			25
Ectopria nervosa	1	1	
Psephenus herricki	37	2	
Scirtidae			2
Stenelmis	37	5	3
Tropisternus			-99
DECAPODA			
Orconectes luteus	-99		
Orconectes virilis			1
DIPTERA			
Ablabesmyia		24	5
Ceratopogoninae	1	3	
Chironomidae	1		1
Chironomus	1	13	
Cladopelma		1	
Cladotanytarsus	1	9	
Corynoneura	1		
Cricotopus bicinctus	8		4
Cricotopus/Orthocladius	10		
Cryptotendipes		1	
Dicrotendipes	1	1	1
Forcipomyiinae		1	
Hemerodromia	2		
Hexatoma	5	2	
Labrundinia	1		7
Lopescladius	1		
Natarsia		1	
Parachironomus			1
Paratanytarsus		1	16

Aquid Invertebrate Database Bench Sheet Report
Little Niangua R [132000], Station #3, Sample Date: 9/17/2013 10:15:00 AM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Paratendipes		14	
Pentaneura	11	7	
Phaenopsectra		1	
Polypedilum flavum	82		
Polypedilum illinoense grp	10		14
Polypedilum scalaenum grp		2	
Procladius		3	
Pseudochironomus		4	1
Rheotanytarsus	22		1
Simulium	5		
Stempellinella		2	
Stictochironomus		1	
Tabanus	1		
Tanytarsus	28	27	14
Thienemanniella	9		
Thienemannimyia grp.	6	5	
undescribed Empididae		3	
EPHEMEROPTERA			
Acentrella	3		
Acerpenna	57		1
Baetis	39		
Caenis anceps	27	85	1
Caenis latipennis	1	68	11
Choroterpes	4	33	1
Isonychia bicolor	9		
Leucrocuta	9		
Maccaffertium pulchellum	12		
Procloeon		8	1
Stenacron	1		
Stenonema femoratum	2	13	4
Tricorythodes	33		2
LUMBRICINA			
Lumbricina	1		
LUMBRICULIDA			
Lumbriculidae		1	
MEGALOPTERA			
Corydalus	1		
NEOTAENIOGLOSSA			
Elimia	2	2	6
ODONATA			
Argia	2		2
Basiaeschna janata			-99
Enallagma		1	35
Gomphidae	2		
Hagenius brevistylus	3	2	

Aquid Invertebrate Database Bench Sheet Report
Little Niangua R [132000], Station #3, Sample Date: 9/17/2013 10:15:00 AM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Macromia			-99
PLECOPTERA			
Neoperla	9		
TRICHOPTERA			
Cheumatopsyche	111		
Hydroptila	4	1	1
Oecetis			3
Oxyethira			1
Triaenodes			5
TRICLADIDA			
Planariidae	3		5
TUBIFICIDA			
Branchiura sowerbyi		9	
Limnodrilus hoffmeisteri			1
Tubificidae		3	3
VENEROIDA			
Corbicula	-99	1	

Aquid Invertebrate Database Bench Sheet Report
Little Niangua R [149829], Station #1, Sample Date: 3/20/2014 10:00:00 AM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina	33	3	2
AMPHIPODA			
Crangonyx			1
BASOMMATOPHORA			
Menetus			2
Physella			1
COLEOPTERA			
Berosus		1	
Dubiraphia		4	4
Dytiscidae		1	
Stenelmis	1	19	
DECAPODA			
Orconectes luteus		1	1
Orconectes virilis			1
DIPTERA			
Ablabesmyia		5	1
Ceratopogoninae	32	18	
Chironomidae	4	12	
Chironomus		1	
Cladotanytarsus		87	
Corynoneura	4	2	19
Cricotopus bicinctus	12	1	23
Cricotopus/Orthocladius	96	46	51
Cryptochironomus		14	
Demicryptochironomus		1	
Dicranota	1		
Dicrotendipes	3	16	
Eukiefferiella	54	1	2
Hemerodromia	5		
Hexatoma	1	1	
Hydrobaenus		7	4
Labrundinia		1	9
Microtendipes	8	2	
Nanocladius	4		15
Orthocladius (Euorthocladius)	4		
Parakiefferiella	3	8	1
Parametriocnemus	34		4
Paratanytarsus			6
Paratendipes		10	
Phaenopsectra		5	
Polypedilum aviceps	3	1	4
Polypedilum flavum	17		3
Polypedilum illinoense grp		1	1

Aquid Invertebrate Database Bench Sheet Report
Little Niangua R [149829], Station #1, Sample Date: 3/20/2014 10:00:00 AM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Polypedilum scalaenum grp		4	
Procladius		4	
Prosimulium	1		
Pseudochironomus	8	10	
Rheocricotopus			1
Rheotanytarsus	6		12
Silvius	1		
Stempellina		1	
Stempellinella	11	53	3
Stictochironomus	2	1	
Sympotthastia	2	1	1
Synorthocladius	9		1
Tabanus	1		
Tanytarsus	32	186	33
Thienemanniella		1	11
Thienemannimyia grp.	20	5	10
Zavrelimyia	1		2
EPHEMEROPTERA			
Acentrella	1		
Acerpenna	25		
Caenis anceps	9	9	
Caenis latipennis	5	11	
Callibaetis			17
Ephemera simulans		1	
Ephemerellidae	14		
Heptageniidae	17		1
Isonychia bicolor	15		
Leptophlebia			1
Maccaffertium mediopunctatum	14		
Maccaffertium terminatum	2	4	
Stenacron	1	3	
Stenonema femoratum		8	
Tricorythodes	12		
LUMBRICINA			
Lumbricina	3		
LUMBRICULIDA			
Lumbriculidae		1	
MEGALOPTERA			
Corydalus	1		
NEOTAENIOGLOSSA			
Elimia	1		4
ODONATA			
Basiaeschna janata			1
Didymops		1	
Dromogomphus			1

Aquid Invertebrate Database Bench Sheet Report
Little Niangua R [149829], Station #1, Sample Date: 3/20/2014 10:00:00 AM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Enallagma			1
Gomphidae		1	
PLECOPTERA			
Amphinemura	14		
Chloroperlidae	5		
Isoperla	45		14
Neoperla	18	1	1
Perlesta	9		
Perlidae	6	2	4
Perlinella ephyre		1	
Prostoia	49		5
TRICHOPTERA			
Agapetus	1	1	
Cheumatopsyche	51	1	1
Chimarra	6		
Hydroptila	2		
Nectopsyche			1
Oecetis			1
Pycnopsyche		1	1
Triaenodes			1
TUBIFICIDA			
Branchiura sowerbyi		1	
Limnodrilus hoffmeisteri		2	2
Tubificidae	3	10	1
VENEROIDA			
Corbicula	2	1	

Aquid Invertebrate Database Bench Sheet Report
Little Niangua R [149830], Station #2, Sample Date: 3/20/2014 12:00:00 PM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina	7	12	10
AMPHIPODA			
Allocrangonyx	1	1	
BASOMMATOPHORA			
Menetus	1		
Physella	3		1
COLEOPTERA			
Berosus		1	
Dubiraphia		2	1
Dytiscidae		2	
Microcylloepus pusillus	1		
Optioservus sandersoni	3		
Psephenus herricki	2	1	
Stenelmis	10	7	1
DECAPODA			
Orconectes luteus	-99		
DIPTERA			
Ablabesmyia		12	1
Ceratopogoninae	9	18	2
Chironomidae	5	1	1
Chironomus		1	
Corynoneura	6	6	15
Cricotopus bicinctus	7		9
Cricotopus/Orthocladius	51	56	55
Cryptochironomus		8	
Cryptotendipes			1
Dicrotendipes		4	
Eukiefferiella	91	1	23
Hemerodromia	3		
Hexatoma	-99		
Hydrobaenus		34	2
Labrundinia		1	2
Nanocladius	2	2	1
Nilotanypus	1		
Orthocladius (Euorthocladius)	1		
Paracladopelma		1	
Parakiefferiella	2	5	2
Parametriocnemus	18	1	
Paraphaenocladius		1	
Paratanytarsus	1	10	37
Paratendipes		3	
Phaenopsectra		4	3
Polypedilum aviceps	11		

Aquid Invertebrate Database Bench Sheet Report
Little Niangua R [149830], Station #2, Sample Date: 3/20/2014 12:00:00 PM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Polypedilum flavum	11		3
Polypedilum illinoense grp			2
Polypedilum tritum			1
Potthastia		1	
Procladius		5	1
Pseudochironomus		2	
Rheocricotopus	1		
Rheotanytarsus	14		9
Simulium	7		
Stempellinella	6	14	
Stictochironomus		7	
Sympotthastia	1		2
Synorthocladius	2		
Tabanus	1	-99	
Tanytarsus	23	74	15
Thienemanniella	5		11
Thienemannimyia grp.	8	23	
Tipula	-99		
Tribelos		1	
Zavrelimyia			1
EPHEMEROPTERA			
Acentrella	3		
Acerpenna	21		
Caenis anceps	5	55	4
Caenis latipennis	6	25	4
Callibaetis			7
Centroptilum		1	
Ephemerella invaria	3		1
Eurylophella bicolor		1	1
Isonychia bicolor	12		
Leptophlebia		1	2
Maccaffertium mediopunctatum	4		
Maccaffertium pulchellum	7	1	
Maccaffertium terminatum	2		
Stenonema femoratum	2	4	2
Tricorythodes	9		
LUMBRICINA			
Lumbricina	7	2	
MEGALOPTERA			
Sialis		1	
NEOTAENIOGLOSSA			
Elimia	1		
ODONATA			
Basiaeschna janata			1
Enallagma		1	2

Aquid Invertebrate Database Bench Sheet Report
Little Niangua R [149830], Station #2, Sample Date: 3/20/2014 12:00:00 PM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Gomphidae		1	
Hagenius brevistylus		2	
PLECOPTERA			
Allocapnia	6		
Amphinemura	15		
Chloroperlidae	42	1	
Hydroperla	-99		
Isoperla	37		2
Neoperla	11		
Perlesta	21		1
Prostoia	52		
Strophopteryx fasciata	2		
TRICHOPTERA			
Cheumatopsyche	86		2
Chimarra	5		
Hydroptila	2		1
Neophylax	2		
Oecetis	1		
Pycnopsyche			1
Rhyacophila	1		
TRICLADIDA			
Planariidae	10		
TUBIFICIDA			
Aulodrilus		1	
Enchytraeidae		2	
Tubificidae		2	
VENEROIDA			
Corbicula	5	2	

Aquid Invertebrate Database Bench Sheet Report
Little Niangua R [149831], Station #3, Sample Date: 3/20/2014 1:10:00 PM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina	43	14	9
AMPHIPODA			
Hyalella azteca		2	24
BASOMMATOPHORA			
Ancylidae		1	
Gyraulus	-99	4	
Helisoma			3
Lymnaeidae	-99		
Physella		1	2
COLEOPTERA			
Berosus	1	4	1
Dubiraphia		2	5
Dytiscidae	-99	4	1
Peltodytes			1
Psephenus herricki	1		
Scirtidae			1
Stenelmis	27	1	1
DIPTERA			
Ablabesmyia		23	2
Ceratopogoninae	40		5
Chironomus		1	1
Chrysops		1	1
Cladotanytarsus	6	17	
Corynoneura	4		16
Cricotopus bicinctus	12	1	7
Cricotopus/Orthocladius	93	26	134
Diamesa	1		
Dicrotendipes	3	8	1
Dixella			1
Eukiefferiella	124	5	15
Hemerodromia	7		
Hexatoma	-99	-99	
Hydrobaenus		14	6
Labrundinia	1	2	6
Nanocladius	1		7
Parakiefferiella	2		1
Paralauterborniella		1	
Parametriocnemus	22		2
Paratanytarsus		2	20
Paratendipes		29	
Phaenopsectra		10	3
Polypedilum aviceps	3		2
Polypedilum flavum	7		1

Aquid Invertebrate Database Bench Sheet Report
Little Niangua R [149831], Station #3, Sample Date: 3/20/2014 1:10:00 PM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Polypedilum illinoense grp		1	2
Polypedilum scalaenum grp		2	
Procladius	1	7	
Prosimulium	1		
Pseudochironomus		10	
Rheotanytarsus	8		7
Stempellinella	3	17	
Sympotthastia	7		5
Synorthocladius	1		1
Tabanus	-99		
Tanytarsus	48	77	11
Thienemanniella	4	1	2
Thienemannimyia grp.	1	11	1
EPHEMEROPTERA			
Acentrella	1		
Acerpenna	1		
Caenis anceps	11	33	2
Caenis latipennis	6	7	19
Callibaetis			15
Ephemerella invaria	1		
Eurylophella			2
Heptageniidae	1		
Isonychia bicolor	-99		
Leptophlebiidae		1	6
Maccaffertium pulchellum	-99		
Stenonema femoratum		4	
LUMBRICINA			
Lumbricina	7	4	
NEOTAENIOGLOSSA			
Elimia	-99	1	3
ODONATA			
Argia	1	-99	2
Enallagma			6
Gomphidae		2	
Libellula		-99	
Progomphus obscurus			1
PLECOPTERA			
Amphinemura	20		
Chloroperlidae	47	13	2
Isoperla	16		
Neoperla	2		
Perlidae	17		23
Perlinella ephyre		1	
Prostoia	4		1
TRICHOPTERA			

Aquid Invertebrate Database Bench Sheet Report
Little Niangua R [149831], Station #3, Sample Date: 3/20/2014 1:10:00 PM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Agapetus	1		
Cheumatopsyche	7		
Chimarra	1		
Hydroptila	4		3
Oecetis	2		
Oxyethira			1
Pycnopsyche			1
Rhyacophila	1		
Triaenodes			6
TRICLADIDA			
Planariidae	7		1
TUBIFICIDA			
Enchytraeidae	1		
Tubificidae		2	2
VENEROIDA			
Corbicula		2	
Pisidiidae	1	1	